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ABSTRACT

The objective of this study was to find variables that are related to creativity and customary productivity dynamically. The subjects were 86 pupils of a secondary comprehensive school differentiated into age groups of 13, 14, 15, and 16 in southern Finland. Three tests and a matrix questionnaire were constructed for the variables. The data were obtained during school lesson time. The reliabilities and validities of the measures were examined in classic and novel ways. The overall coefficients were rather satisfactory. The expectation constructed for the relationships of the variables was partially corroborated. The least square fit indicated that variables followed a relationship expressed as an equation. The main variables that had the greatest interaction with creativity were reasoning, well-being, and cognitive organization, in that order. Customary productivity was joined with primitive and depressive affects most powerfully. Results suggest theoretical implications for changing the conservative nature of education and didactics. (Contains three tables, one figure, and two references.) (Author/SLD)

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An Educational Stance On Relationships of Cognitive Organization, Affective States, Reasoning, Creativity, and Customary Productivity In Age of 13-16

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Abstract

The objective of the study was to find variables that are related with creativity and customary productivity, dynamically. The subjects were 86 pupils of a secondary comprehensive school from the same school district differentiated into age groups of 13, 14, 15, and 16, in Southern-Finland. Three tests and a matrix questionnaire were constructed for the variables. The data were obtained during the lessons. The reliabilities and validities of the measures were examined with a classic and novel way. The overall coefficients were rather satisfactory. An expectation was constructed for the relationships of the variables. The expectation was corroborated, partially. The least square fit indicated that the variables follow with the equation $y = -a+bLog_2(x)$ and the lower the start level of the variable, the quicker it develops in the process. The main variables which had the greatest interaction with the creativity were the reasoning, the well-being affects, and the cognitive organization in the mentioned order. The customary productivity was joined with the primitive and depressive affects most powerfully. The results warranted theoretical implications of changing the conservative nature of education and didactic.

An Educational Stance On Relationships of Cognitive Organization, Affective States, Reasoning, Creativity, and Customary Productivity In Age of 13-16.

There is a myriad of studies, which deal with the variables in the title but what does an educational stance mean. Education appears in pairs of teacher-pupil(s), educator-educatee(s), instructor-pupil(s), coach-student(s), and coach-sportsmen/women, for example. A consistent question is: what is common to the pairs? The answer is they are role bound. Is education the education of roles and their expectations? If not what then? What are the characteristic features of education that no other dynamic relationships have? Two features are, present and future. It is somewhat surprising if somebody educates somebody for past. Who is that somebody without roles who educates someone without roles? In principle, anybody who has what. Experience, knowledge, "backbone," training, etc.

Nature has no such qualities and it probably is the first educator together with a human being him or herself. In reality, education has been self-education for adaptation in natural conditions and

thereafter social in nature. Transfer from collecting economy to shepherd life, trough riverside settlement to agriculture, and then urbanization, has demanded increased education that has been social in nature and concentrated to take new tools, devices, and vehicles into use. In the long run the circumstances have become softer, at least partially, to persons whose basic needs are satisfied. Persons do not have to play zero-sum game with nature, any more. It is not difficult to guess life has been much of balancing in the cross-pressure of the laws of avidity and least effort.

Along the development there have been the questions of power, particularly the domination of minds in the name of education. The so called education has been dogmatic putting of persons in mental jails that still continues. If a human wants to be in a mental jail then there is not much to do with the help of education. A fact is clear persons learn from persons. Thus social environment is a mediator between environment and an individual.

An individual learns, not necessarily adopts, the ways of culture where he or she lives which become the glue that sets the boundaries of individuality and mostly in

a conservative way. That is why it is essential to emphasize dynamic way of seeing real events in education, especially in teacher education where the dogmatic and haughty persons have to drop out in filtering the persons into schooling. The standpoint I have not seen mentioned in teacher education. Although, the number of teachers is numerous who fulfill the definitions of the behaviors according to my 20 year experience on the various levels of educational system. When the extension of educator is widened it is possible to replace it with for example teacher, coach, and instructor. Analogously, the educatee(s) is replaceable for example with pupil or student. However, the change of parts may occur when the educatee(s) has such knowhow the educator does not have.

At the very bottom, I see education is to coach the educates to avoid the mental jails that social environment or parts of it construct for the sake of gaining power and inducing dependency relationships for the cumulative orgasmic domination those, not positioned as well in society. The matter is much of mind control. That is why it is necessary to educate people to gain knowledge of how things function and

progress to increase control in their own circumstances. Natural is persons examine events from their own starting points, but that does not justify intolerance and social exploitation. So education of natural variety among persons is important because it may open mind. Furthermore, practical knowledge of social environment is necessary for the sake of not becoming to defraud.

However, education is influence in mind that sometimes is forgotten. Propaganda and advertising are parallel processes with education where the senders or unknown persons attempt to direct the behavioral choices of the receivers. The diversity of the processes is a matter of degree. The derivation from the old differentiation of feeling, knowledge, and will to emotion, cognition, and conation, does not make the matter clearer until the secrets of mind are revealed. It brings fort potentialities for education to differentiate between propaganda, education, and advertising. A fact is promising for education of creativity, it is unpredictability that means greater social freedom, honoring privacy and dignity of persons, not the mental jails.— That is for the educational stance.

Theoretical Examination of Problem

A mindy is a process of organic unity of mind that includes a preparatory subprocess characterized as serial and regulatory, and a making subprocess that is autonomous and processes information parallel (Laasonen, 1993). The mindy processes meanings as information. The mindy is elastic but it looses it and becomes plastic in assimilation, diffusion, and absorbtion with other mindies. In addition, mind uses mental shapes as sketches for the construction of a mindy, and stabilization of a mindy transforms it into a configuration which is resistant to change for example attitude, belief, and role.

For the sake of analysis it is necessary to differentiate the mindies of the study into cognitive, affective, reasoning, and creative. However, the first three ones are difficult to differentiate in praxis because they are entangled. Furthermore, their proportions to each other differ in time. The essential point is, the mindies are processes and they are to deal with accordingly, dynamically.

The object variable of the study is creativity and it is not likely other variables individually are responsible for the occurrence of creativity. On the

contrarary, the most probable alternative is the subject variables have joint influences in creativity. What these are, is the main problem of the study with the variables of cognitive organization, affective states, reasoning, creativity, and customary productivity.

The theoretical procedure is, the definitions of the variables are given and thereafter the expected relationships of the variables are scrutinized which results a hypothesis in a form of an expectation.

Cognitive organization purposes a dynamic order of cognitions or the order of judging environmental information that transforms into a conceiving order. Of course, the cognitive organization can be approached from a more traditional viewpoint but traditions in research enterprises are burdens because the task of research is to produce new organized knowledge. The definition of cognitive organization leaves open form and contents of organization because orders are many and the ones stabilized are not necessarily related with reality. Although, they can be relevant analytically.

An affective state means experiental feeling which

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as compared with emotion, does not contain physiological states but is experienced, lived. The definition of the affective state gives more degrees of freedom to scrutinize the state because it is joined with mind, merely, not with its habitat. Thus the affective state is a mind state.

Reasoning is a process where new outcomes are inferred from known truthful facts. The definition does not limit the type of the reasoning for example logical or everyday ones because behavior as such is not consistent and includes error, randomness, or unexplained events whatever name one wants to use from the probabilistic nature of behavior. For example, the reasoning bases on beliefs that produce new beliefs, an unfortunate situation, anyway.

Creativity is the production of new things irreducible to the old ones. The definition does not accept creativity as new associations of the old things. The crucial point is, a thing is new and not reducible because otherwise the thing is not new and is reducible. The products of creativity can be a new angle of vision, concept, method, or a new hard technological innovation produced by soft brains.

The consequence of defining creativity in above way

gives a possibility to define the customary productivity as a complement of creativity without new solutions.

Formerly, I notified that a mindy can be a suitable concept for the analytical purposes of the study. Next I apply the unit process of mind to the defined variables.

From the angle of the mindy the variables of the study,which are processes, have an ignition subprocess and a making ready subprocess. In the ignition subprocess the regulation part "fires" diffusing the whole outfit that is needed for a mindy construction and gives the rules for the making ready subprocess. After it the regulation part draws from the situation and the control transfers to lower parts in the hierarchy of the functions. Simultaneously, automation steps in the picture in the parallel making process In praxis the function of the mindies can be verified disturbing a person concentrated on working with a task. When automation has begun the person tolerates interruptions. Instead, in the firing phase the person becomes aggravated from disturbances.

Earlier I shortly presented the probable interaction between the elastic mindies. In this

context, I have to remark that assimilation, absorbtion, and diffusion have nothing to do with chemistry. Whereas they mean the relationships in those cases when the unit processes lose their elasticity and begin to interact in the plastic states. Thus in conformity with another terminology, there is no strangeness to say an image of mind assimilates another image, an image absorbs other one, or a certain image has diffused into others. The image is not a process that is why it is deleted in this context. Furthermore, the mindy has empirical evidence from its existence as a process in reality (Laasonen 1993).

From the angle of creativity it is useful to assume that the average routines to construct new mindies demand erroneous or random function in the processing of information. So a creative outcome is an intermixture of interaction and error or randomness. Thus a creative product is a kind of disturbance that deviates from the customary solution. In this specific case it is supposed the mindies of cognitive organization, affective state, and reasoning jointly produce creative mindies. A matter is good to notice in this context, time is within the variables and it makes the subject more complex.

Naturally, the expectation is more a guess than a derived hypothesis because of the lack of organized theory that is able to produce behavior of the variables in differing conditions. In this particular case it is not relevant to construct the expectation of age phases but to reason the behavior of variables in the whole time span, 4 years. The details of the ages, if any, reveal during the process analysis. The reason for the extended time span is that a more specified expectation needs a more thorough knowledge than theoretically is possible at this moment.

In place thereof, it can be assumed the creative mindies are processes where none of the subject variables alone but they together in proportion to each other produce the creative mindies. I hope it is not too optimistic to expect that the order of processing cognitions strengthens in proportion to the affective states and the reasoning, the affective states weaken in proportion to two other variables, and the reasoning grows most in proportion to the cognitive organization and the affective states. The joint function of the subject processes generates an increase of the creative mindies in the 4 year time interval.

Putting it simply the expectation includes the

aspect that the affective states little by little transform into energizing factors of behavior. It means growth of judgment and sharpening of the reasoning, a kind of cooling down in behavior when experiences cumulate from environment through the social environment. A youthful learns to regulate his or her behavior. It takes place through the reasoning and grinding the affective states more adaptable to the prevailing cultural conditions and to the ways of society. So the cognitive organization and the reasoning increase their proportions, especially the reasoning affects the creative mindies because the young persons learn to draw the conclusions of their own. According to the rational hypothesis persons are presumed to be reasonable and to behave coolly in differing conditions.

Method

Subjects

The subjects were 87 seven pupils from a secondary comprehensive school, in the same school district in a city in southern Finland. The answers of a subject had to be overruled because of missing information.

Measure Devices

Measuring cognitive organization took place with

a constructed Pin-test. The test included six items with the as-if pins put upwards and downwards in a regular manner. The items formed an order of increasing complexity. The affective state measure was an answering matrix with the affects in the rows and a Likertian type of scale in the columns: occur in me very often, often, once and a while, seldom, and very seldom. There were 20 affective states. Reasoning was measured with a Billiard-ball test with 15 items where the subjects had to infer what happens when the balls move in certain ways. Creativity was measured with an L-bar test where an L-bar was put in different statures and the subjects had to complete the L-bars into a drawing. The test included six items.

Procedure

Obtaining the data took place during the lessons and the answering lasted about 20 minutes. No great disturbances occurred during the answering.

The Pin-test was instructed: There is set of pins below that have been set according to rules. Your task is to continue the series of the pins drawing the last pins on the lines in the figures after the rules, upright or upside down. The instruction for the affects was: There is a set of

words down left that describes affects of persons and above them is a scale where are the occurrences of affects. Your task is to mark a cross in the set of squares of the affect and of the scale. Mark only one cross for every affect.

The Billiard-ball test instruction was: The starting point of the task is there are balls of different color on the pool table. Your task is to tell what takes place to the balls when there is action on the table. The answers are written on the lines.

The instruction of creativity was: There a set of figure initials below and Your Task is to continue the initials in the way the figures become complete. You can draw whatever you want.

After obtaining the data, the subjects differentiated into four age groups 13, 14, 15, and 16 years of aged. The subject distribution of age was 13, 27, 36, and 10.

Results

Item Analysis

The measures were of different kind and so they needed a specific manipulation each.

The Pin-test scored calculating the deviations below and above the right answers in the items. The

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correct answers were scores as zeroes and the values below them had a minus sign. Two items had to be deleted because of missing information. The deviations were added over the subjects and the resulted sums were scaled. Thereafter, the variances of the items were calculated and the same ones with the greatest variances in each age group were included in the image of the cognitive organization. The procedure resulted in 3 items left.

The affects scored from 5 to 1 scores along the scale. The frequencies were calculated into the response heads and then the frequencies were turned into statistical probabilities in the age groups. The greatest probability in the response heads was selected to present the item. However, there occured clustering of the affects according to the probabilities which resulted in a classification of the affects into (a) well-being affects (ecstasy, joy, happiness, pleasure), (b) primitive affects (disgust, rage, anger, annoyance), (c) sudden affects (astonishment, amazement, surprise), (d) fear affects (terror, panic, fear, apprehension), and (e) depressive affects (grief, sorrow, dejection, gloominess, loathing, dislike)

The Billiard-ball test included right answers, too.

So it justified to dichotomize the items and to select the same items in every age group with the greatest variances.

The L-bar test was also dichotomized according to novelty of the drawings. The measuring included evaluative function and subjectivity could not be excluded in the scoring. However, I have evaluated a couple of hundred drawings of creativity that allowed educated guesses in the scoring. The items with the greatest variances through the age groups were included in the proper measure. The numbers of zeroes were calculated that corresponded the scoring of the customary drawings.

Reliability and Validity

The measures were homemade that is why it was necessary to assess their qualities. The coefficients of alpha were calculated to see the level of error of measurement in a classic sense.

Insert Table 1 about here

Statistically, the coefficients are satisfactory in spite of the unreliability of the age 15 in cognitive organization and the relatively low values

Table 1

Alpha Coefficients of Variables in Age Groups

	Age Group			
Variable	13	14	15	16
Cognitive organization	.73	.74	.02	.65
Well-being affects	.98	.98	.99	.99
Primitive affects	.97	.98	.98	.98
Sudden affects	.98	.99	.99	.99
Fear affects	.96	.97	.97	.98
Depressive affects	.98	.98	.99	.98
Reasoning	.88	.87	.87	.91
Creativity	.59	.66	.42	.65

in creativity.

The error, however, in the psychometric theory forms a problem because the nature of error seldom is known, whether it is randomness, white noise, or something else. The defect produced another way to see reliability. The total variance differentiated into joint variance, aggregate variance, and separate variance. The variances have their counterparts on the various levels of measurement. The separate variance is equal to the sum of the individual variances of the items. The aggregate variance is the same as the variance of the direct sum of the item scores. The joint variance is the sum of the covariance matrix cells. The angle of view includes an assumption the joint variance is the proper indicator of item interaction. Thus the aggregate and separate variances are error variance seen from the joint variance. In the same way the separate variance is error about the aggregate variance. A light formalization defends it place in this context. Let it be v_t^2 = total variance, v_j^2 = joint variance, v_a^2 = aggregate variance, and v_s^2 = separate variance. Thus the total variance is

$$v_t^2 = [v_j^2-(v_a^2+v_s^2)+(v_a^2-v_s^2)] \qquad (1)$$

The equation 1 includes the true and error components that are needed for reliability or reliability = true variance/total variance. The equation did not apply to the cognitive organization because its image of the variable almost is plain deviation. In a compact form the reliability of the cognitive organization was examined with $r_{ii} = 1-v_o^2/v_{max}^2$ where the numerator is the observed variance and the denominator is the maximum possible variance that can be obtained when half of the subjects have the maximum scores and the other half has minimum scores. The 1 is the maximum reliability.

The second way of calculating reliability resulted in the coefficients in Table 2.

Insert Table 2 about here

The comparison between the values in Tables 1 and 2 indicates that the new kind of coefficients are lower throughout the measures which probably indicates considering other factors which are to be included in

Table 2

Reliability Coefficients with Known Error in Age Groups

	Age Group			
Variables	13	14	15	16
Cognitive organization	.64	.81	.97	.15
Well-being affects	.86	.92	.94	.91
Primitive affects	.90	.83	.91	.88
Sudden affects	.77	.88	.88	.91
Fear affects	.77	.72	.81	.68
Depressive affects	.88	.82	.88	.83
Reasoning	.51	.58	.64	.64
Creativity	.07	.25	.00	.14

psychometric measure theory than earlier. At all events, the nominalistic approach of the measure theory needs revision to cover the variety of behavior.

The new equation for reliability already included the variance components. So it was convenient to apply the squared correlations between the equations of the age groups calculated from the raw values of the equations. The squared correlation is also known as the coefficient of determination which indicates the common variance between the variables if the direction of influence is clear. The measures had time order which meant the establishment of the asymmetry between the measures and warranted the use of the squared correlation as shown in Table 3 for a kind of predictive validity.

Insert Table 3 about here

The cognitive organization formed an exception this time, too. The squared correlation was calculated between the observed and maximum variances over the age groups. The values of Table 3 are reasonably good for the similarity between the variables through the age groups. So the measures are not sensitive to age fluctuations but they behave

Table 3

Squared Correlations between Measures in Age Groups

Cognitive organization: $r^2 = .08$

Well-being affects

Age	13	14	15	16
13		.99		
14			.99	
15				.99

Primitive Affects

	13	14	15	16
13		.99		
14			.99	
15				.99

Sudden affects

Age	13	14	15	16
13		.99		
14			1.00	
15				.99

Fear affects

	13	14	15	16
13		.99		
14			.99	
15				.98

Depressive affects

Age	13	14	15	16
13		.99		
14			.99	
15				.99

Reasoning

	13	14	15	16
13		.98		
14			.99	
15				.99

Creativity

Age	13	14	15	16
13		.96		
14			.91	
15				.94

consistently and probably measure what they are to measure.

Analysis of Dynamics

The main result is the empirically obtained values of the variables carry out an equation of the form $y = -a + bLog_2(x)$. The equation resulted in the least square fitting. Before the equation was obtained the sum scores after the item analysis had to be weighted with two coefficients (a) one for the age (b) one for the frequency distribution of the subjects. The ages were added or 13+14+15+16 and they were divided by the sum, which resulted in the weigh of age. The frequencies of the subjects in the age groups were divided by 86 which produced the percentages of the subject distribution. The sum scores were multiplied with the weights and the age groups were joined that meant from 1 to 86 observation points for each variable. The first approximations of the least square fitting referred to the linear relations in the variables. However, the

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cumulation of the variable values pointed out that logarithms were suitable in this context because the values of the cumulative distributions differed much. So it proved to be that the coincidence of empirical and theoretical values was good. The mere equation did not offer a firm basis for the interpretation of the start situation (y intercepts), velocity (the slope coefficients), and the goal situation (the last cumulative values of the variables).

That is why it was necessary to do a more comprehensive scrutiny among the values of the variable equations. The Spearman rho was calculated with the start values, the velocity coefficients, and the goal values. The rho between the start situation and the velocity coefficients is -0.88, $p < .01$. The rho between the start situation and the goal situation is 0.94, $p < .01$., and the rho of velocity and of the goal situation is -0.28. The inverse relationship between the initial situation and velocity indicates the lower the start level of the variables is the quicker they develop. Putting the velocity coefficients into the order which the hypothesis presumes. The test of the hypothesis takes place with a help of a figure, which shows the relationships of the variables. The lines in

the figure correspond the velocity coefficients.

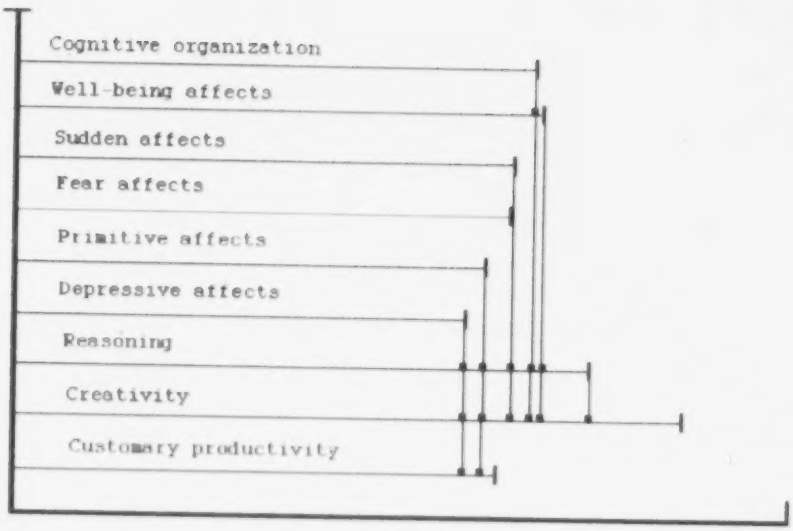
Insert Figure 1 about here

Discussion

A few viewpoints have to be taken into account before the conclusions. The starting levels of the variables are the outcomes from earlier development during about 13 years. Second, the variables in Figure 1 interact that can be verified from the lengths of the horizontal lines about each other. Thus the velocity coefficients are proportional.

However, the intersecting points that are significant to the expectation or to the hypothesis are drawn in sight. The points of the intersection of the customary productivity are visible because of the contrast with creativity. From the basis of the starting situations, the velocities, and the goal situation some conclusions emerge from the process.

The substantiation is the hypothesis is corroborated, partially. From Figure 1 the vertical lines and their intersecting points with the horizontal ones verify. The cognitive



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organization strengthens with other affects than the well-being affects (contrary to the hypothesis). The order of processing cognitions does not strengthen in proportion to the reasoning but the reasoning becomes more important (contrary to the hypothesis). Correspondingly, the sudden, fear, primitive, and depressive affects weaken compared with the cognitive organization and the reasoning. The reasoning becomes most influential about the affects and the cognitive organization, except the well-being affects. The variables have joint functions during the dynamism that generate the increase of creative mindies but their mutual proportions differ during the dynamics. The reasoning, the well-being affetcs, and the cognitive organization are the most important to the creativity in that order.

A more detailed examination of the process reveals, the reasoning, the well-being affects, the sudden affects, and the primary affects accentuate, lightly. The cognitive organizations, the fear affects, the customary productivity, and the depressive affects become more unimportant during the dynamics, a little bit. Paying attention to the three

most important variables indicate that the proportion of the cognitive organization diminishes and the reasoning and the well-being affects emphasize in the process. Therefore from the angle of vision of the mindies the development of creativity probably demands an assimilated mindy that includes processing of motion in mind, positive states of the affects, and some orderliness of processing cognitions. It is likely the assimilated mindy is necessary for the development of dynamic creative mindies. Thus behavior of a youthful who is creative includes vivid real imagination, good feeling, and a certain amount of undisciplined cognitive processing of environmental information. On the contrary, the customary productivity is more synchronal with the primitive and depressive affects.

The results have implications to educational theory construction as well. A derivation is the creativity presupposes such kind of an assimilated mindy or processing environmental information where the serial control processes are not very rigid or locked beforehand and the making parallel processes tolerate changes and revisions during making the creative mindy. Theoretically, the question is about to find an

optimal solution to the assimilated mindy to educate and promote creativity as well as to release the rigid processes joined with the customary productivity. I am fully aware that the social environment where the young persons live sets the boundary conditions which determine much of creative and customary behavior. However, there are possibilities to offer the joy of production in a minor scale, for example in schools because quantity is not all but quality, be it less, may stimulate further development.

Didactically, the results offer potentiality of application, although the general importance of the results is questionable. The entity obtained refers to continuous development, not to discrete growth where the leaps occur. In the institutional settings when the young persons transfer from the primary degree to the secondary one, the start levels remain unknown. In spite of it the curriculum includes opportunities to individual curriculums but what is the basis of the individual curriculums. Evidently, the principle of "I feel." The lack of the start levels produces a shortcoming the operations during the secondary comprehensive school are similar to the six blind men and an elephant. The operations are gently said random because

of insufficient information. The curriculums do not originate from the young persons but from the conceptions the adults have about the young persons. That is why it is necessary to arrange rigid frameworks for learning because existent knowledge is not taken the best possible advantage of those who need it most, the growing ones. The purpose is to promote the so called maintenance learning (Botkin, 1979) that includes rigid, intolerable angles of vision about the world and the methods, accordingly. No dynamics, no motion, only one alternative of management. In other words, the question is about a conservative behavior with old methods to new situations. The situation betters, especially through teacher education where the processual thinking might have its place. Instead, narrowing the natural variety in the name of individuality or social "play-rules ", the didactic probably has such tasks, as promoting tolerance. The customary productivity may join with the development of authoritarianism, energy of which comes from fear and depressive states of affects, that are the bars of the mental jails. Therefore, creation of positive experiences, for example arranging teaching situations which include the joy of finding, rather than to lie crouching errors the

young persons do, may be more fertile for a dynamic didactic, from the viewpoint of the goal states.

As to the problem, I have to verify it had a partial solution and more reseach is needed to fill with the whole dynamic of the variables. I see it self-satisfied to evaluate the contribution of the study because time is the best evaluator for those works that have a lasting influence in education.

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Figure Caption

Figure 1. Dynamic relations of variables.

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